Water Use Permitting in Minnesota and Michigan

Wisconsin Legislature
Groundwater Working Group
October 1, 2009

Larry Lynch, Hydrogeologist
Wisconsin DNR
Bureau of Drinking Water & Groundwater

Minnesota Water Appropriations Permit Requirements

- Applies to surface water and groundwater
- Any domestic use serving more than 25 persons
- Any use that exceeds 10,000 gallons per day or 1 million gallons per year

MN Water Appropriation Permit Environmental Review Criteria I

- If less than 30 million gallons per month (~700 gpm), case by case evaluation
  - Look for known problems in the area
  - Assess potential for well interference with domestic users
  - High concentration of hi-volume users
  - Possible impacts to trout streams, wetlands and other important surface water features
  - If in area of state with limited hydrogeological information, may require an aquifer test
- May limit the requested appropriation amount and may reduce the appropriation amount of previously approved users to accommodate a new user

MN Water Appropriation Permit Environmental Review Criteria II

- If a new commercial or industrial withdrawal greater than 30 million gallons per month or for irrigation of 540 acres or more, formal environmental review is required
  - Extensive aquifer testing (7 to 30 days)
  - Determine sustainable withdrawal rates to ensure aquifer and resource protection
    - **Protect the source aquifer from overpumping**
    - **Identify domestic wells which could be affected**
    - **Protect groundwater-dependent resources such as calcareous fens, springs and trout streams**

MN – Aquifer Protection Criteria

- If domestic wells could be affected, applicant must propose solutions and modify the wells, as necessary
- Water level monitoring from source water and connected resources
- DNR may establish aquifer protection limits based on available head in the aquifer
  - **50 % of the pre-pumping head triggers additional monitoring requirements**
  - **If draw down to 25% of the pre-pumping head, the withdrawal must cease**
- DNR may limit surface withdrawals based on stream flow data

MN - Water Use Priorities

1. 

Domestic water supply

2. 

Consumptive less than 10,000 gallons/day

3. 

Agricultural irrigation & processing of agric. products

4. 

Power production

5. 

Consumptive uses in excess of 10,000 gallons/day

6. 

Non-essential uses

MN Water Use Priorities

- In situations where there is not enough water for all users, lowest priority uses are shut down first
- Conflict resolution process generally favors higher priority uses

MN – Water Use Conflict Areas

- Competing demands of existing and proposed users exceed the reasonably available water supply
- Existing permits do not establish right of use
- DNR may modify proposed and existing appropriations
- If conflicts cannot be resolved through modification, similar priority users develop plan for distribution of water
- If users are of different priorities, higher priority user shall be satisfied first and remaining water is allocated to remaining users based on priority until all no further water is available

Michigan Water Withdrawal Regulatory Thresholds

- Applies to groundwater, surface water, Great Lakes and inland waters
- Withdrawals <100,000 gpd are not regulated
- The following withdrawals require a site-specific permit:
  - **>5 million gpd from the Great Lakes and connecting waterways**
  - **>2 million gpd from inland waters**
  - **>250,000 gpd for bottled water**
- Withdrawals >100,000 gpd but less than permit thresholds must register and use the water assessment tool

Michigan Large Quantity Water Withdrawal Assessment Tool

- Withdrawals may not result in an "adverse resource impact"
- Assessment tool is available on-line
- Assessment tool is a screening mechanism to identify those proposed withdrawals that will not cause adverse impacts
- The tool never says "no" – only "yes" or "take the proposal to the DEQ for site-specific evaluation"
- Water withdrawals may go forward without any site-specific review if they meet the conditions of the Assessment Tool

MI – Adverse Resource Impact I

- Uses projected changes in fish populations as criteria for determining Adverse Resource Impact

- Changes in fish populations are predicted based on reductions in stream flow (reduction in index or low flow) as a result of the proposed withdrawal

- Allowable change in fish population and reduction in index flow varies depending on stream classification – some stream types (e.g., cold water systems) are more sensitive to flow reductions

MI – Adverse Resource Impact II

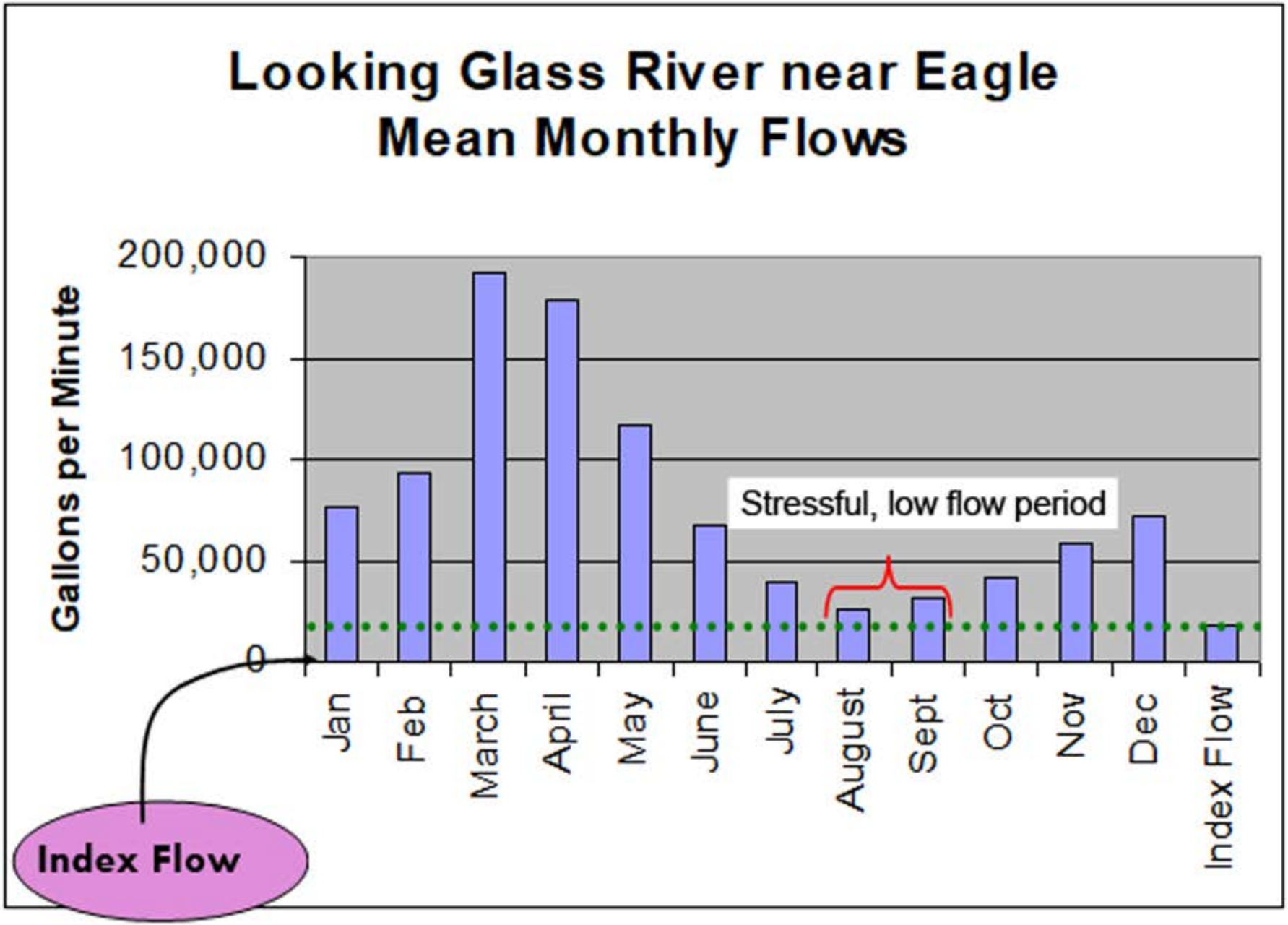
- **Streams and Rivers**
  - any withdrawal resulting in a specified % decrease in either thriving fish populations or characteristic fish populations as the result of a reduction in the Index Flow.
  - Any withdrawal decreasing the Index Flow by more than 25%.
- **Lakes**
  - Decreasing the level of a lake >5 acres in size, through a direct withdrawal, in a manner that would impair/destroy the uses made of the lake or functionally impair the ability of the lake to support characteristic fish populations.

MI – Withdrawal Assessment Tool

- Links 3 separate models
  - Stream Flow Model
  - Groundwater Withdrawal/Stream Depletion Model
  - Fish Response Model

The Stream Flow Model

- Predicts index flows for over 7,000 watersheds in the state
- “Index flow”; median flow in month of lowest flow, typically August
- Index flows were determined for streams with reliable stream flow gauging records (135 stream gauging stations) and extrapolated for other stream segments based on statistical a regression analyses.
- Major Factors Used in Regression Analyses
  - **Drainage Basin Size**
  - **Forest Cover, Land Use**
  - **Geology and Soils**
  - **Region of the State**



Slide from MI Institute of Water Research

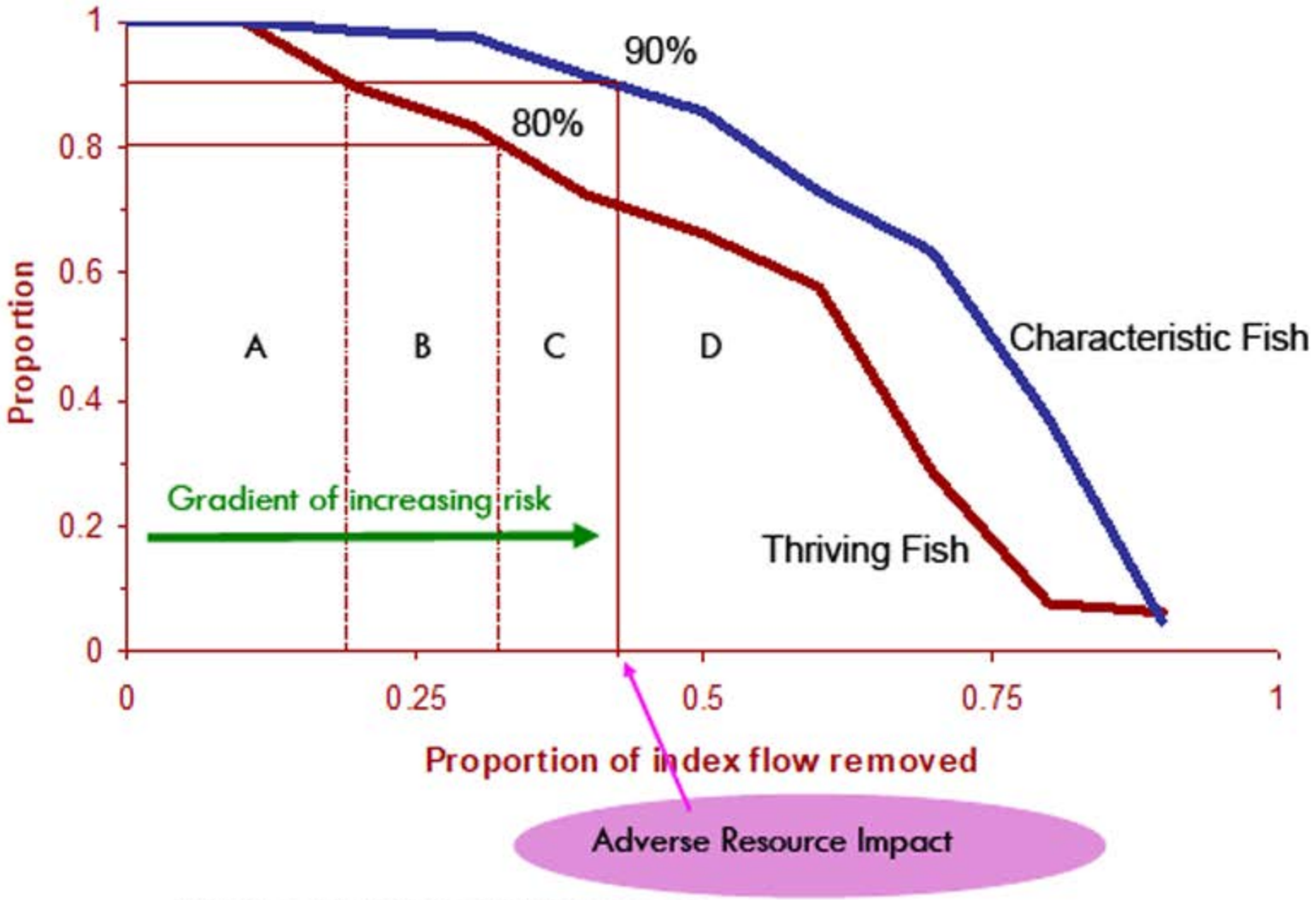
MI Groundwater Withdrawal Model

- **Groundwater conditions and aquifer parameters are derived from the MI Groundwater Inventory and Mapping database**
  - **Withdrawals from below a confining layer, within most bedrock units and from deep within thick unconsolidated aquifers have negligible or reduced impacts on the stream**
- **Automatically considers the location of nearest streams and apportions the withdrawal effect among them**
- **Calculates the likely reduction in stream flow due to the proposed withdrawal based on pumping capacity and schedule, geologic conditions and distance to stream**

The Fish Response Model

- **Define Stream Types and "Characteristic Fish Populations"**
  - **Classify streams based on size and water temperature**
  - **11 different cold, cool, transitional and warm water classifications with corresponding fish populations**
- **Define "Functional Impairment" to Fish Populations due to water withdrawals, e.g., how much can flow be reduced without substantially affecting fish populations**
- **Determines how much water is available in a given stream segment or watershed and recalculates this amount after a new withdrawal is registered**

Interpreting the Fish Curves With an Eye to Policy



Slide from MI Institute of Water Research

MI – Allowable Reduction in Index Flow

Temp	Size	Zone A (% Index Flow)	Zone B (% Index Flow)	Zone C (% Index Flow)	Zone D (% Index Flow)
Cold	Stream	Reduction < 14	None	14 ≤ Reduction < 20	Reduction ≥ 20
	Small R.	Reduction < 10.5	None	10.5 ≤ Reduction < 21	Reduction ≥ 21
Cold Trans	Stream	None	Reduction < 4	None	Reduction ≥ 4
	Small R.	None	Reduction < 2	None	Reduction ≥ 2
	Large R.	None	Reduction < 3	None	Reduction ≥ 3
Cool	Stream	Reduction < 6	6 ≤ Reduction < 15	15 ≤ Reduction < 25	Reduction ≥ 25
	Small R.	Reduction < 15	15 ≤ Reduction < 19	19 ≤ Reduction < 25	Reduction ≥ 25
	Large R.	Reduction < 14	14 ≤ Reduction < 19	19 ≤ Reduction < 25	Reduction ≥ 25
Warm	Stream	Reduction < 10	10 ≤ Reduction < 18	18 ≤ Reduction < 24	Reduction ≥ 24
	Small R.	Reduction < 8	8 ≤ Reduction < 13	13 ≤ Reduction < 17	Reduction ≥ 17
	Large R.	Reduction < 10	10 ≤ Reduction < 16	16 ≤ Reduction < 22	Reduction ≥ 22

MI – Assessment Tool "Impact Zones"

- **Zone A – Applicant may register the withdrawal and proceed**
- **Zone B – Generally can go ahead but special requirements for cold-transitional systems**
- **Zone C – May proceed after site-specific review and implementation of conservation requirements**
  - Notify other users and authorize a water users committee
  - Water User Committee or DEQ develops voluntary solutions to prevent adverse resource impacts
- **Zone D – Adverse Resource Impact - Denial**
  - Appeal the decision
  - Try to get other users to reduce withdrawal making more water available
  - Civil suit to define reasonable use

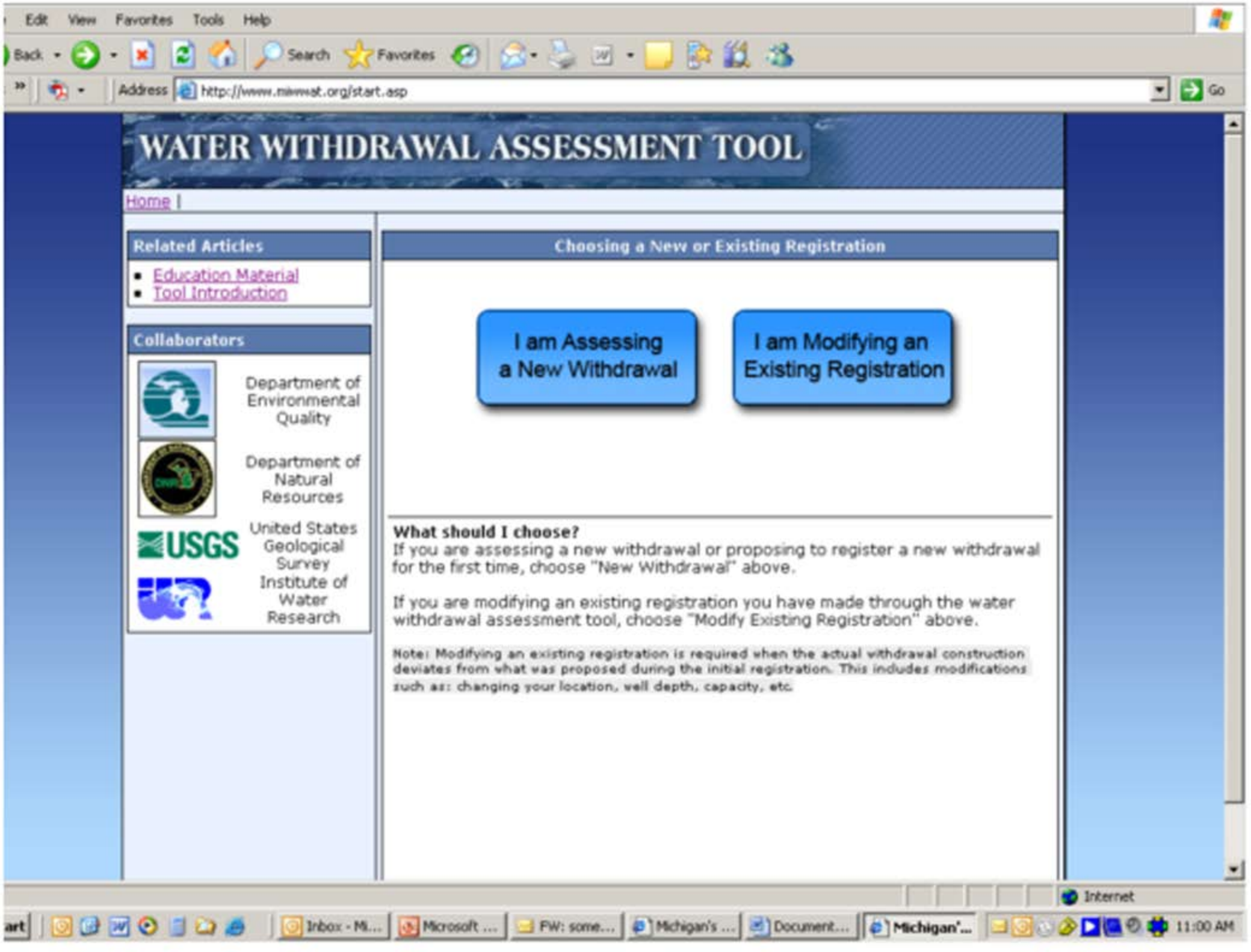
MI Withdrawal Assessment Tool

- Large Quantity Withdrawal Assessment Tool

  http://www.miwwat.org/

- Groundwater Mapping and Inventory

  http://gwmap.rsgis.msu.edu/


Edit View Favorites Tools Help
Back Search Favorites
Address http://www.miwwat.org/start.asp
Go
WATER WITHDRAWAL ASSESSMENT TOOL
Home |
Related Articles
Education Material
Tool Introduction
Collaborators
Department of Environmental Quality
Department of Natural Resources
USGS
United States Geological Survey
Institute of Water Research
Choosing a New or Existing Registration
I am Assessing a New Withdrawal
I am Modifying an Existing Registration
What should I choose?
If you are assessing a new withdrawal or proposing to register a new withdrawal for the first time, choose "New Withdrawal" above.
If you are modifying an existing registration you have made through the water withdrawal assessment tool, choose "Modify Existing Registration" above.
Note: Modifying an existing registration is required when the actual withdrawal construction deviates from what was proposed during the initial registration. This includes modifications such as: changing your location, well depth, capacity, etc.
Internet
Inbox - Mi...
Microsoft ...
FW: some...
Michigan's ...
Document...
Michigan'...
11:00 AM

Edit View Favorites Tools Help

Back Search Favorites

Address http://www.miwwat.org/address.asp?bro=Explorer Go

WATER WITHDRAWAL ASSESSMENT TOOL

Home |

Related Articles

- Education Material
- Tool Introduction

Collaborators

Department of Environmental Quality

Department of Natural Resources

United States Geological Survey

Institute of Water Research

Finding the Location of Your Water Withdrawal

Please select one of the following options for locating the position of your water withdrawal.

Locate by Address

Enter the address and zip code at or near the withdrawal location. Please spell street names correctly in order to ensure system accuracy.

Address:

Zip Code:

Find Address

Locate by County

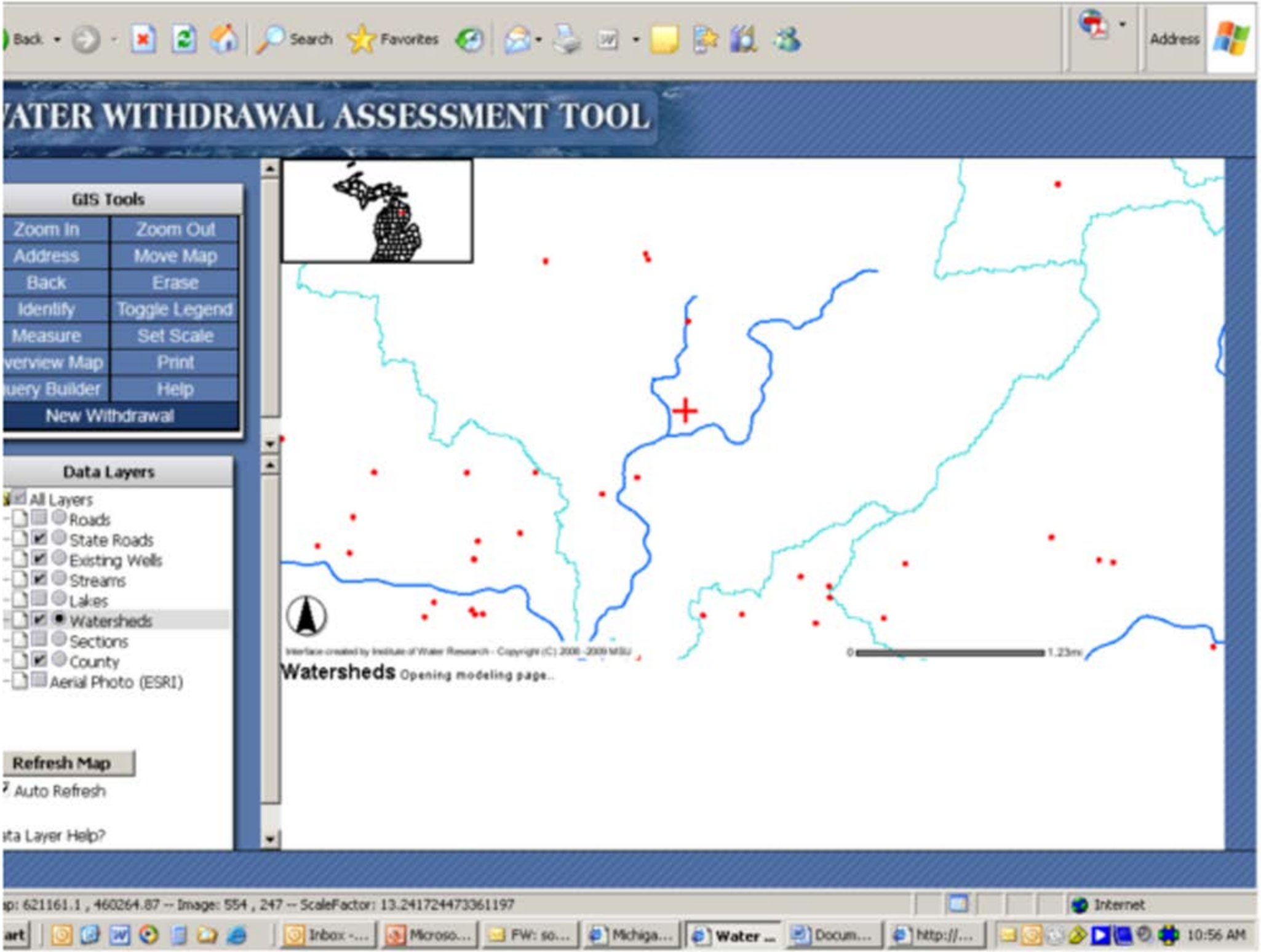
To select the county where the water withdrawal will occur, click the map or choose from the drop down menu.

Crawford

Find County

Internet

Inbox - Micros... Microsoft Powe... FW: some infor... Michigan's W... Michigan's Wat... 11:03 AM

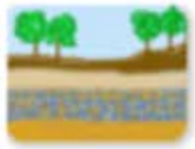

Back
Search
Favorites
Address
ATER WITHDRAWAL ASSESSMENT TOOL
GIS Tools
Zoom In
Zoom Out
Address
Move Map
Back
Erase
Identify
Toggle Legend
Measure
Set Scale
verview Map
Print
uery Builder
Help
New Withdrawal
Data Layers
All Layers
Roads
State Roads
Existing Wells
Streams
Lakes
Watersheds
Sections
County
Aerial Photo (ESRI)
Refresh Map
Auto Refresh
ta Layer Help?
Watersheds Opening modeling page..
Internet
Inbox -...
Microso...
FW: so...
Michiga...
Water ...
Docum...
http://...
10:56 AM

ENTER WITHDRAWAL INFORMATION

Pumping Source and Frequency

Withdrawal Source:

○ Surface Water (from stream)



◉ Ground Water

○ Shallow Pond

Pumping Frequency: ◉ Continuous ○ Intermittent

Pumping Parameters

Pumping Capacity (GPM): 1000

Lat/Long from Map: 44.689968, -84.508125

Well Depth (FT): 251-300

Aquifer Type: ○ Bedrock ◉ Glacial

Current Stats at Location

- Depth to Bedrock (FT): 528
- Average Well Depth (FT): 99
- Percent Wells in Glacial: 100
- Percent Wells in Bedrock: 0

Send to Model

Water Withdrawal Screening Results

WARNING: For demonstration purpose only..

Adverse Resource Impact (ARI) Graph

The ARI graph above illustrates the estimated removal of water from a nearby stream and its potential for causing an adverse resource impact (ARI). Estimated 51 GPM

The proposed withdrawal has faild in Zone D, and is likely to have an adverse resource impact.

Screening Results - FAILED

Instructions:

The proposed withdrawal lies within 'Zone D' and is likely to cause an adverse resource impact. By reducing the flow taken from a nearby stream, you may be able to avoid these impacts and pass the screening process. Here are several examples of what you co[illegible] to help avoid adverse resource impacts:

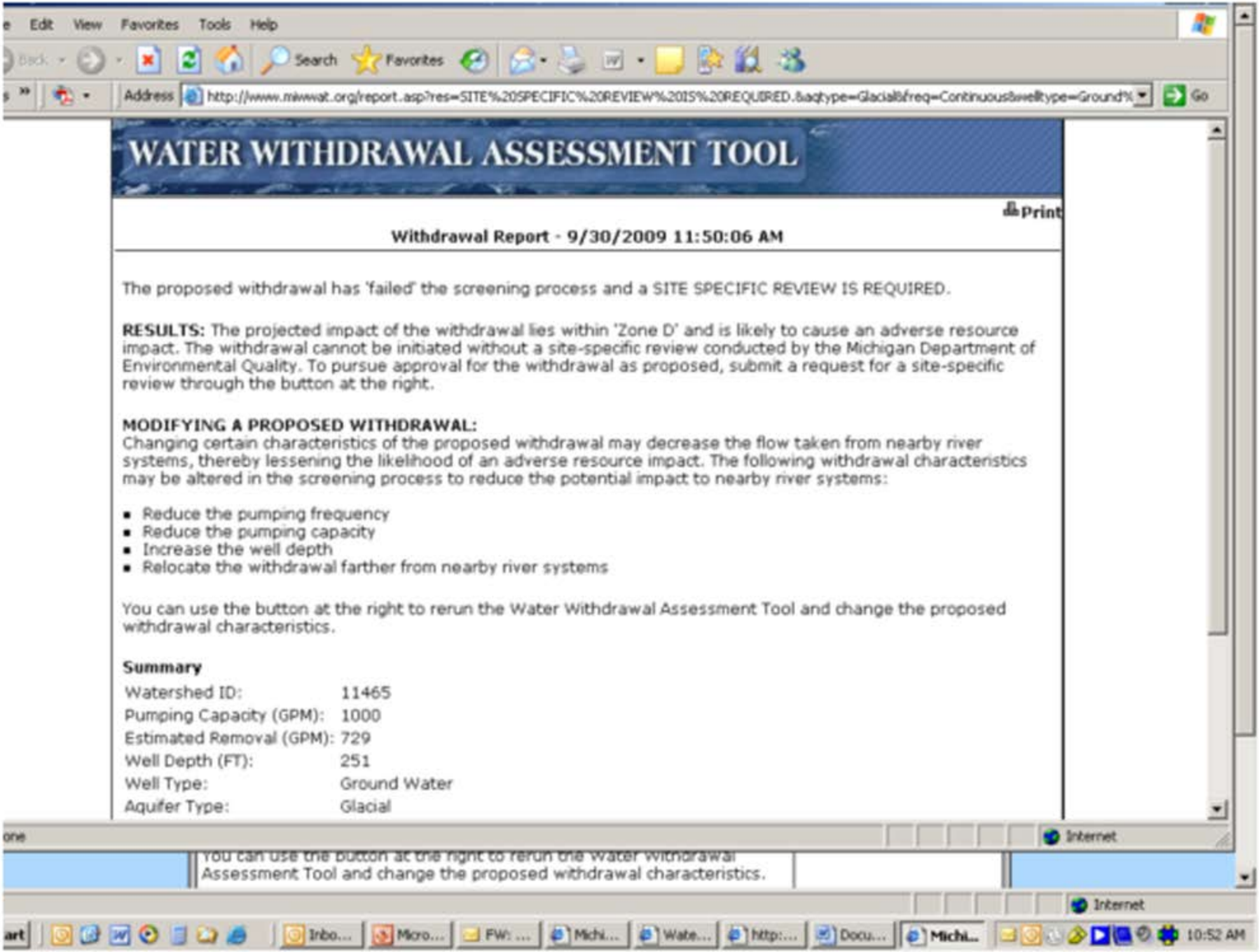
- Increase Distance From Nearby Streams
- Increase Well Depth
- Reduce Pumping Rate

To modify withdrawal characteristics and rerun the screen press 'Rerun'.

This proposed withdrawal cannot proceed unless approved by the Michigan Department of Environmental Quality through a site specific evaluation. A site specific analysis improves the estimate of how much water is available in a stream and may demonstrate additional water is available at this location. Please contact the Michigan Department of Environmental Quality for more information.

Actions:

Help
Rerun
Register Now
Feedback
View Google Map
Print Report
Exit


Edit View Favorites Tools Help
Search Favorites
Address http://www.miwwat.org/report.asp?res=SITE%20SPECIFIC%20REVIEW%20IS%20REQUIRED.&aqtype=Glacial&freq=Continuous&welltype=Ground%
Go
WATER WITHDRAWAL ASSESSMENT TOOL
Print
Withdrawal Report - 9/30/2009 11:50:06 AM
The proposed withdrawal has 'failed' the screening process and a SITE SPECIFIC REVIEW IS REQUIRED.
RESULTS: The projected impact of the withdrawal lies within 'Zone D' and is likely to cause an adverse resource impact. The withdrawal cannot be initiated without a site-specific review conducted by the Michigan Department of Environmental Quality. To pursue approval for the withdrawal as proposed, submit a request for a site-specific review through the button at the right.
MODIFYING A PROPOSED WITHDRAWAL:
Changing certain characteristics of the proposed withdrawal may decrease the flow taken from nearby river systems, thereby lessening the likelihood of an adverse resource impact. The following withdrawal characteristics may be altered in the screening process to reduce the potential impact to nearby river systems:
Reduce the pumping frequency
Reduce the pumping capacity
Increase the well depth
Relocate the withdrawal farther from nearby river systems
You can use the button at the right to rerun the Water Withdrawal Assessment Tool and change the proposed withdrawal characteristics.
Summary
Watershed ID: 11465
Pumping Capacity (GPM): 1000
Estimated Removal (GPM): 729
Well Depth (FT): 251
Well Type: Ground Water
Aquifer Type: Glacial
Internet
You can use the button at the right to rerun the Water Withdrawal Assessment Tool and change the proposed withdrawal characteristics.
Internet
Inbo... Micro... FW: ... Michi... Wate... http:... Docu... Michi... 10:52 AM

ENTER WITHDRAWAL INFORMATION

Pumping Source and Frequency

Withdrawal Source:

○ Surface Water (from stream)

◉ Ground Water

○ Shallow Pond

Pumping Frequency: ○ Continuous ◉ Intermittent

Pumping Parameters

Pumping Capacity (GPM): 1000

Lat/Long from Map: 44.691933, -84.506331

Well Depth (FT): 251-300

Aquifer Type: ○ Bedrock ◉ Glacial

Current Stats at Location

- Depth to Bedrock (FT): 528
- Average Well Depth (FT): 99
- Percent Wells in Glacial: 100
- Percent Wells in Bedrock: 0

Intermittent Pumping Schedule

Pumping Hours/Day: 12

Pumping Days/Week: 4

Months Pumping:

Jan
Feb
Mar
Apr
May
Jun
Jul
Aug

(hold Ctrl to select multiple months)

Send to Model

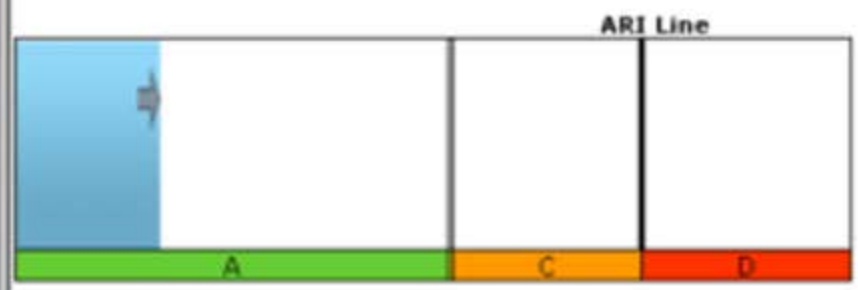
Back
Forward
Save Background As...
Set as Background
Copy Background
Set as Desktop Item...
Select All
Paste
Create Shortcut
Add to Favorites...
View Source
Encoding
Print
Refresh
Convert to Adobe PDF
Convert to existing PDF
Export to Microsoft Excel
Properties

Internet

Inbox - ... | Microso... | PW: so... | Michiga... | Michiga... | Water ... | http://... | 11:05 AM

Water Withdrawal Screening Results

Adverse Resource Impact (ARI) Graph



The ARI graph above illustrates the estimated removal of water from a nearby stream and its potential for causing an adverse resource impact (ARI).

The proposed withdrawal has passed in Zone A.

Screening Results - PASSED

STREAM CLASSIFICATION: Cold stream

Learn More..

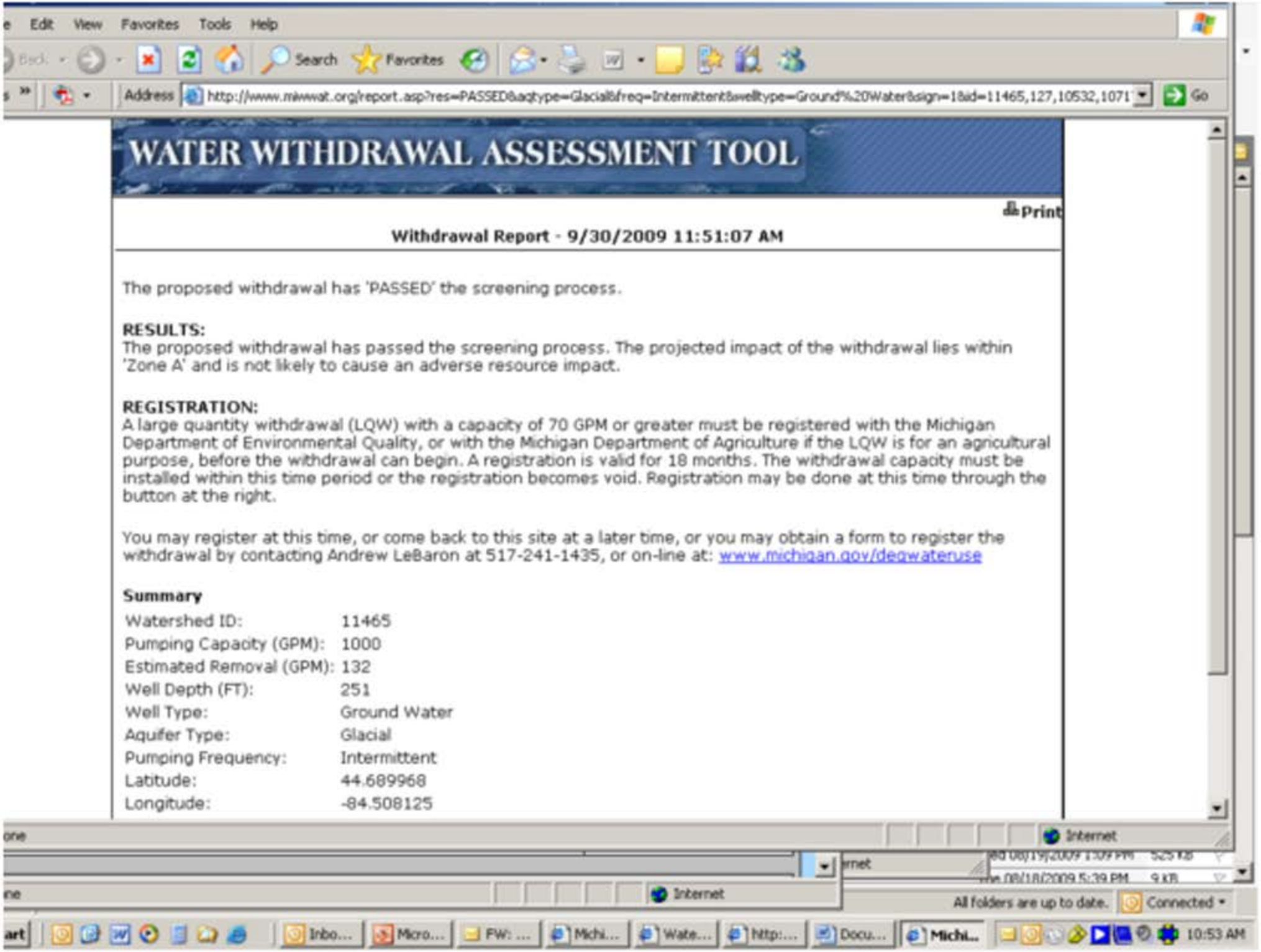
RESULTS:
The proposed withdrawal has passed the screening process. The projected impact of the withdrawal lies within 'Zone A' and is not likely to cause an adverse resource impact.

REGISTRATION:
A large quantity withdrawal (LQW) with a capacity of 70 GPM or greater must be registered with the Michigan Department of Environmental Quality, or with the Michigan Department of Agriculture if the LQW is for an agricultural purpose, before the withdrawal can begin. A registration is valid for 18 months. The withdrawal capacity must be installed within this time period or the registration becomes void. Registration may be done at this time through the button at the right.

You may register at this time, or come back to this site at a later time, or you may obtain a form to register the withdrawal by contacting Andrew LeBaron at 517-241-1435, or on-line at:
www.michigan.gov/deqwateruse

Actions:

- Help
- Rerun
- Register Now
- Feedback
- Print Report
- Administrator
- Exit


Edit View Favorites Tools Help
Search Favorites
Address http://www.miwwat.org/report.asp?res=PASSED&qtype=Glacial&freq=Intermittent&welltype=Ground%20Water&sign=18id=11465,127,10532,1071
Go
WATER WITHDRAWAL ASSESSMENT TOOL
Print
Withdrawal Report - 9/30/2009 11:51:07 AM
The proposed withdrawal has 'PASSED' the screening process.
RESULTS:
The proposed withdrawal has passed the screening process. The projected impact of the withdrawal lies within 'Zone A' and is not likely to cause an adverse resource impact.
REGISTRATION:
A large quantity withdrawal (LQW) with a capacity of 70 GPM or greater must be registered with the Michigan Department of Environmental Quality, or with the Michigan Department of Agriculture if the LQW is for an agricultural purpose, before the withdrawal can begin. A registration is valid for 18 months. The withdrawal capacity must be installed within this time period or the registration becomes void. Registration may be done at this time through the button at the right.
You may register at this time, or come back to this site at a later time, or you may obtain a form to register the withdrawal by contacting Andrew LeBaron at 517-241-1435, or on-line at: www.michigan.gov/deqwateruse
Summary
Watershed ID: 11465
Pumping Capacity (GPM): 1000
Estimated Removal (GPM): 132
Well Depth (FT): 251
Well Type: Ground Water
Aquifer Type: Glacial
Pumping Frequency: Intermittent
Latitude: 44.689968
Longitude: -84.508125
Internet
All folders are up to date.
Connected
10:53 AM

MI – Site Specific Reviews

- DEQ staff review of Assessment tool parameters and findings
  - Generally find there is more water available than tool predicted due to conservative assumptions in the tool >> approve the registration and add water to the "table of available water" for that stream
  - Most applications are approved, fewer than 5% are denied
  - From 10/2008 to 7/2009
    - **329 registrations using the assessment tool**
    - **219 – Zone A, 60 Zone B, 18 Zone C, 32 Zone D**